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Pereira et al.

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(54) **TECHNIQUES FOR REGISTERING AN INTERNET PROTOCOL (IP) ENDPOINT FOR EMERGENCY SERVICES CALLING**

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(51) **Int. Cl.**

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H04W 4/20	(2018.01)
H04W 76/50	(2018.01)
H04M 7/00	(2006.01)
H04W 4/14	(2009.01)

(52) **U.S. Cl.**
CPC ***H04W 4/029*** (2018.02); ***H04M 7/0075*** (2013.01); ***H04W 4/14*** (2013.01); ***H04W 4/20*** (2013.01); ***H04W 76/50*** (2018.02)

(58) **Field of Classification Search**
CPC H04W 4/029; H04W 4/14; H04W 4/20; H04W 76/50; H04M 7/0075
USPC 455/404.2
See application file for complete search history.

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(57) **ABSTRACT**

Techniques are described for obtaining current location data for a non-traditional telephony endpoint for emergency calling purposes. An emergency services (ES) provider receives, from a telephony server responding to a telecommunication session establishment request from a telephony endpoint, a location registration request, the location registration request including telephony endpoint identification information. The ES provider may push a quick response (QR) code to the telephony endpoint, the QR code when scanned by a mobile device causes the mobile device to retrieve its current location data. The ES provider may then receive the current location data from the mobile device and store it and the telephony endpoint identification information for subsequent use should a 911 call be made from that telephony endpoint. The ES provider may then send the telephony server an authorization acknowledgement for the telecommunication session establishment request.

13 Claims, 6 Drawing Sheets

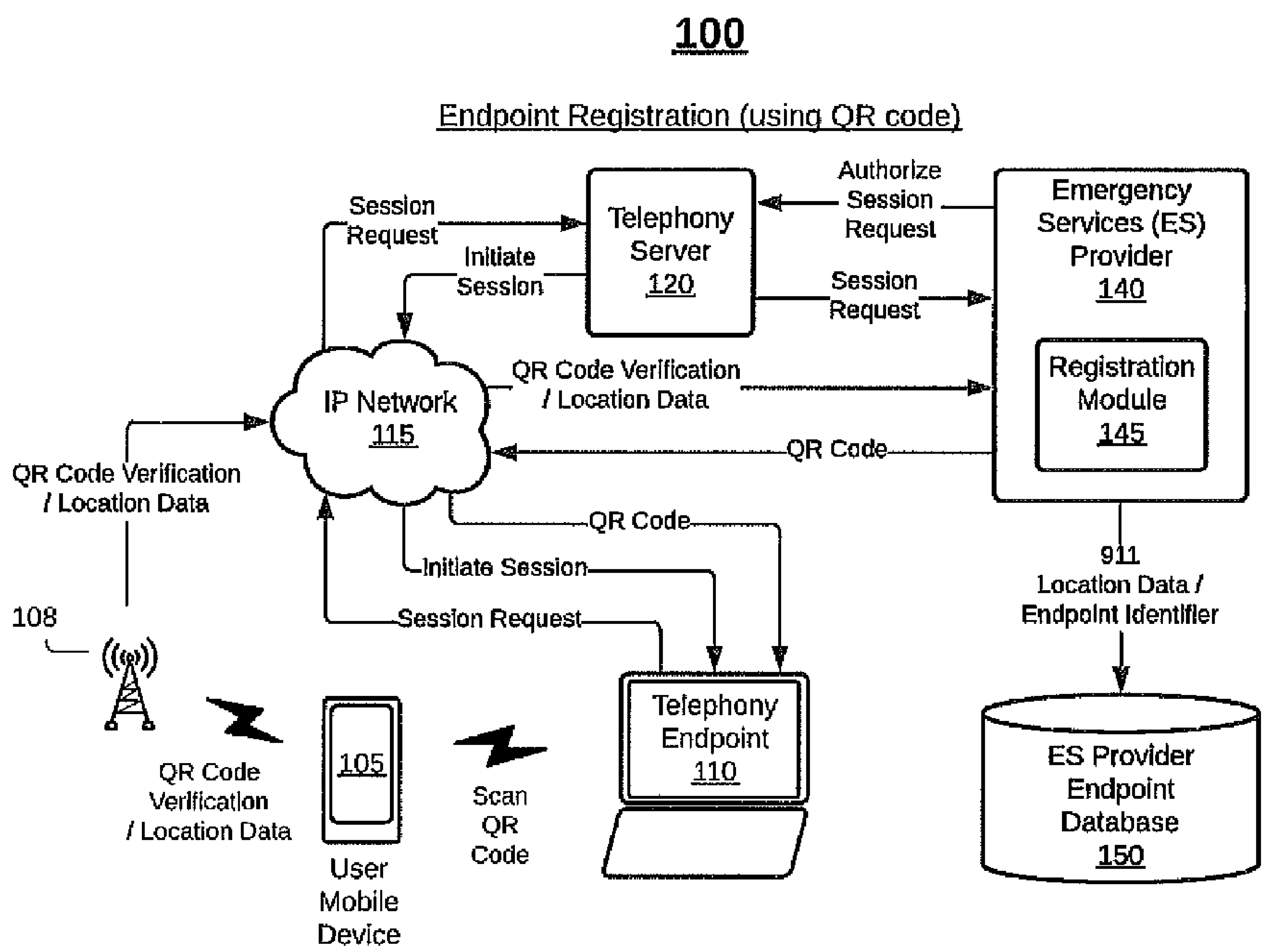


FIG. 1

100

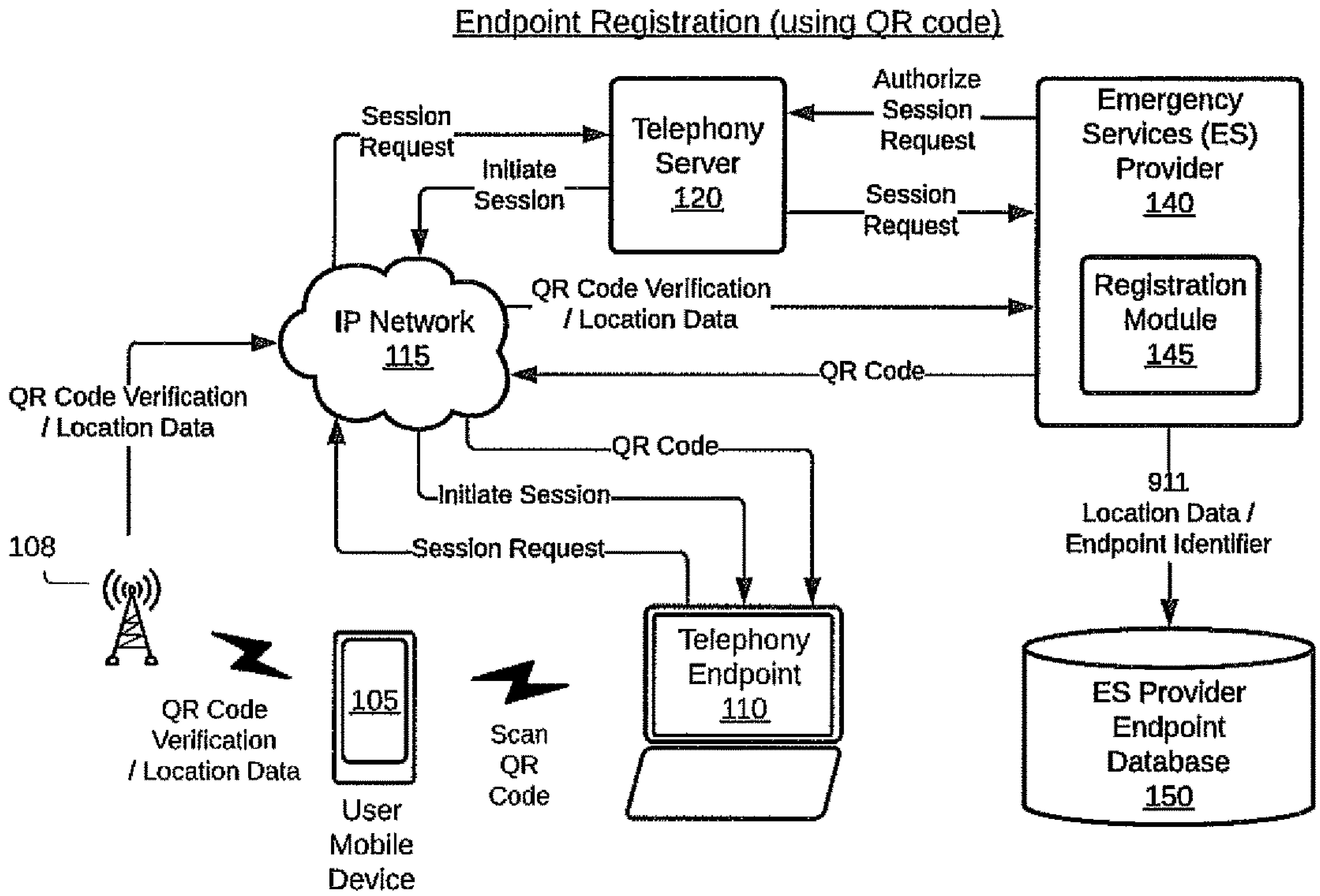


FIG. 2

200

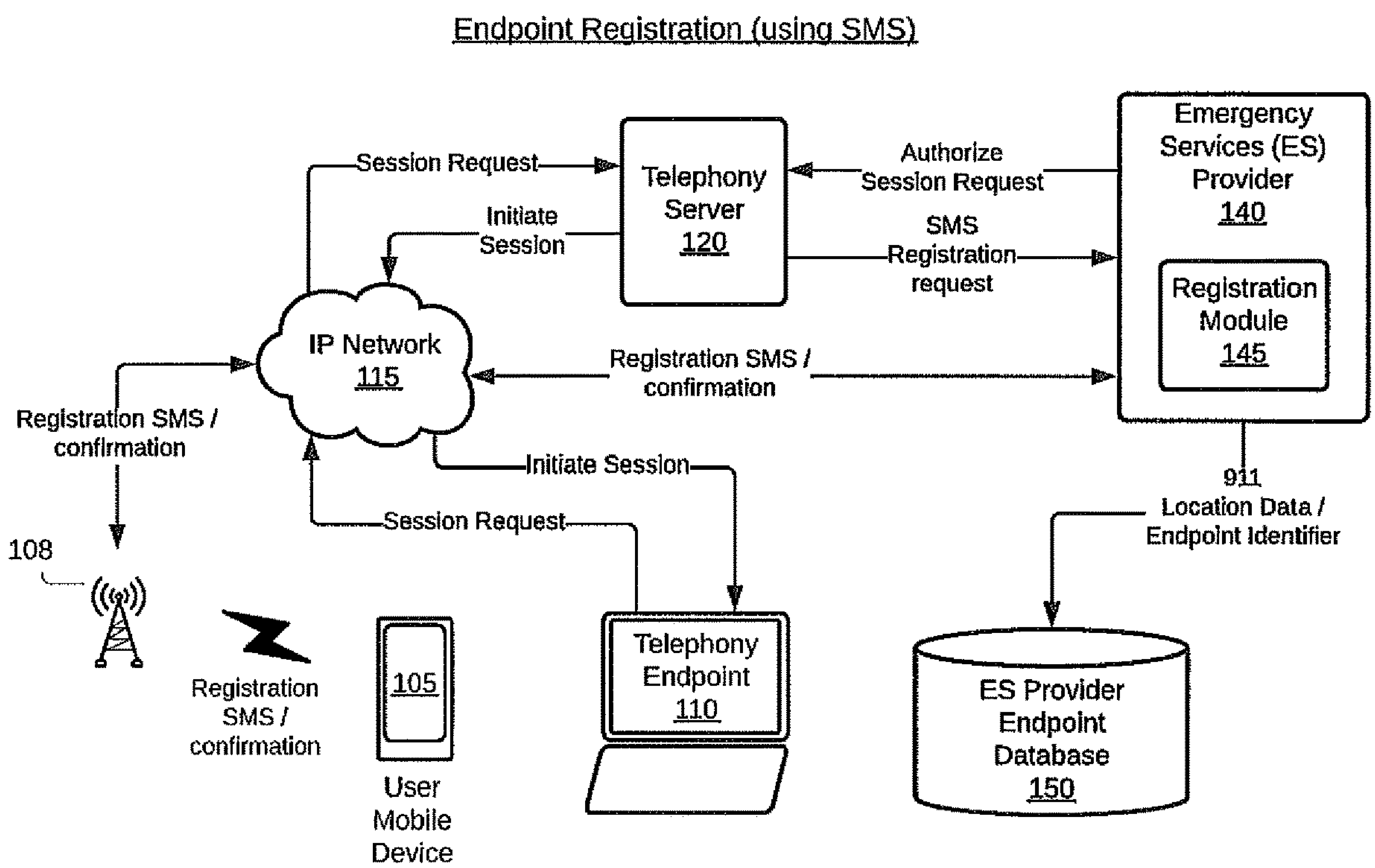
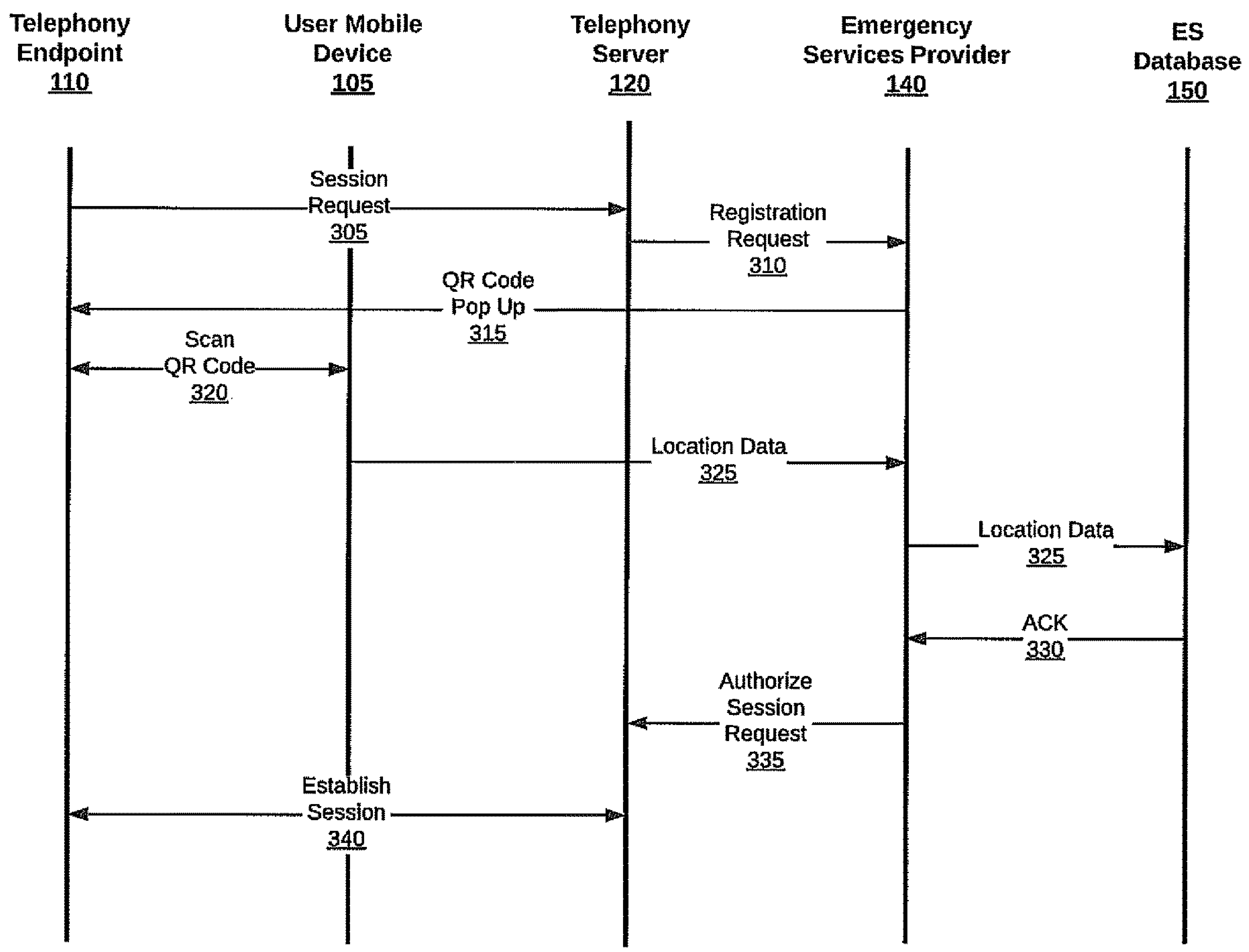
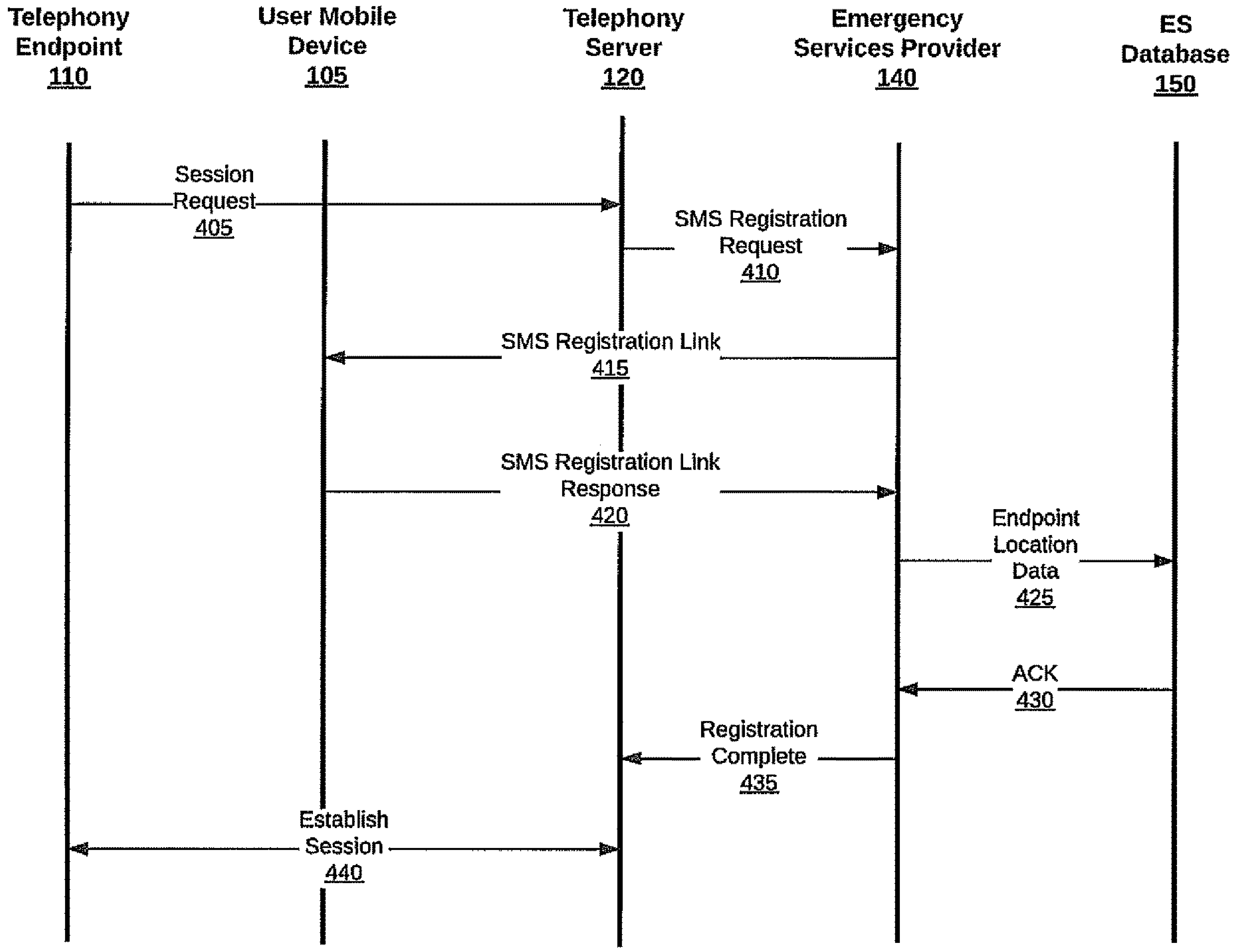


FIG. 3
300



Telephony Endpoint 110
User Mobile Device 105
Telephony Server 120
Emergency Services Provider 140
ES Database 150
Session Request 305
Registration Request 310
QR Code Pop Up 315
Scan QR Code 320
Location Data 325
Location Data 325
ACK 330
Authorize Session Request 335
Establish Session 340

FIG. 4
400



Telephony Endpoint 110
User Mobile Device 105
Telephony Server 120
Emergency Services Provider 140
ES Database 150
Session Request 405
SMS Registration Request 410
SMS Registration Link 415
SMS Registration Link Response 420
Endpoint Location Data 425
ACK 430
Registration Complete 435
Establish Session 440

FIG. 5

500

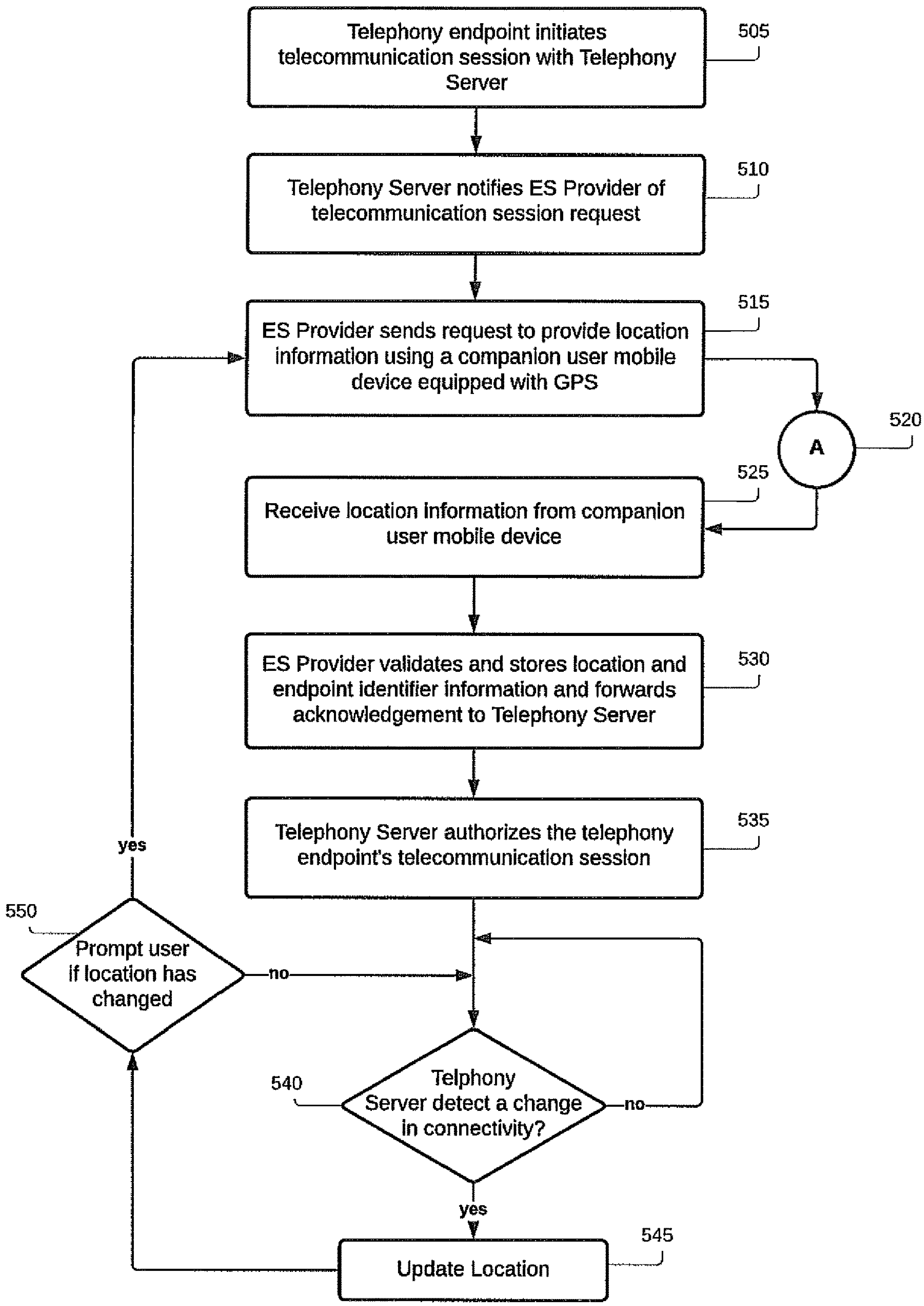

Telephony endpoint initiates telecommunication session with Telephony Server
505
Telephony Server notifies ES Provider of telecommunication session request
510
ES Provider sends request to provide location information using a companion user mobile device equipped with GPS
515
A
520
Receive location information from companion user mobile device
525
ES Provider validates and stores location and endpoint identifier information and forwards acknowledgement to Telephony Server
530
Telephony Server authorizes the telephony endpoint's telecommunication session
535
yes
550
Prompt user if location has changed
no
Telphony Server detect a change in connectivity?
540
no
yes
Update Location
545

FIG. 6
600

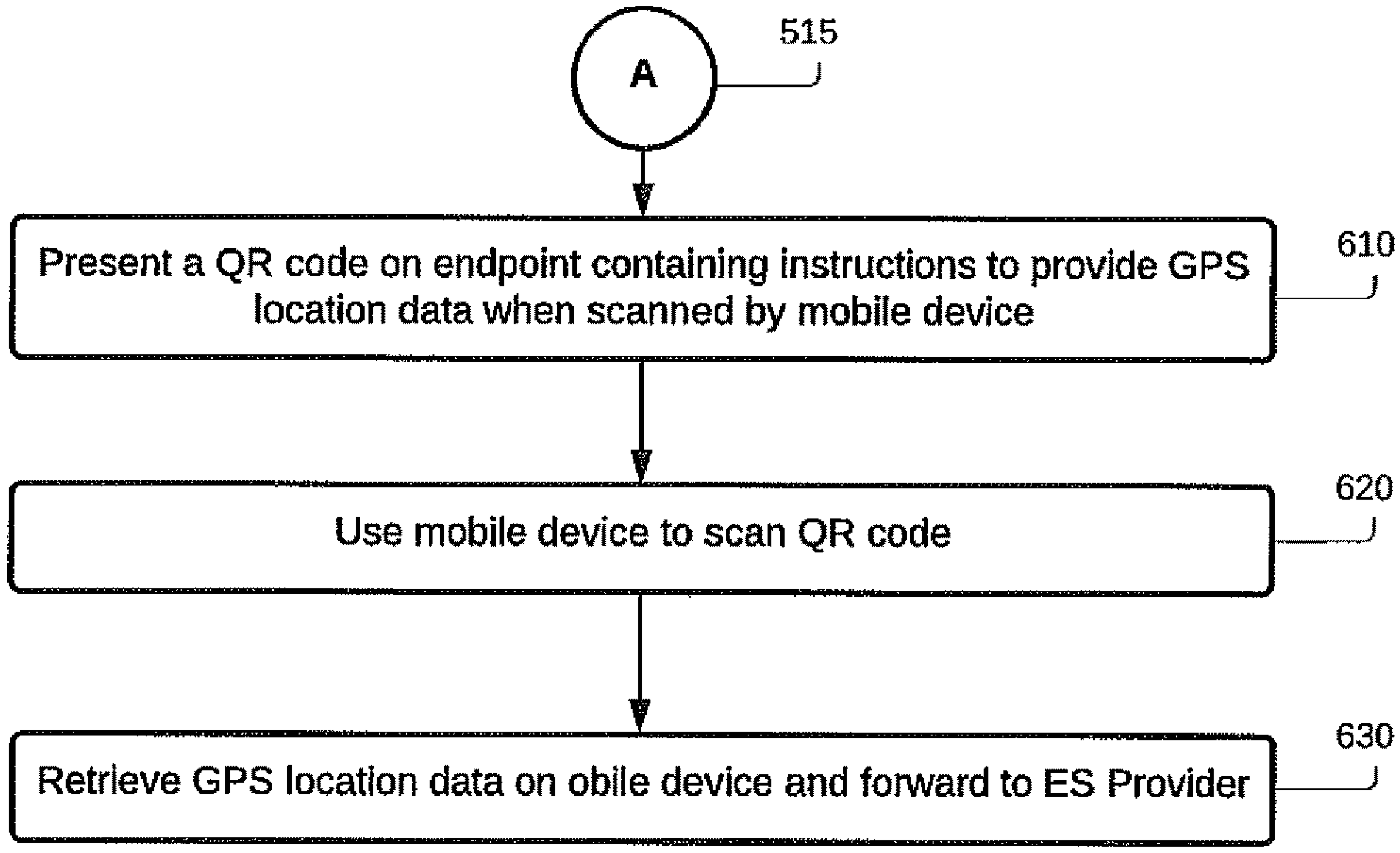


FIG. 7
700

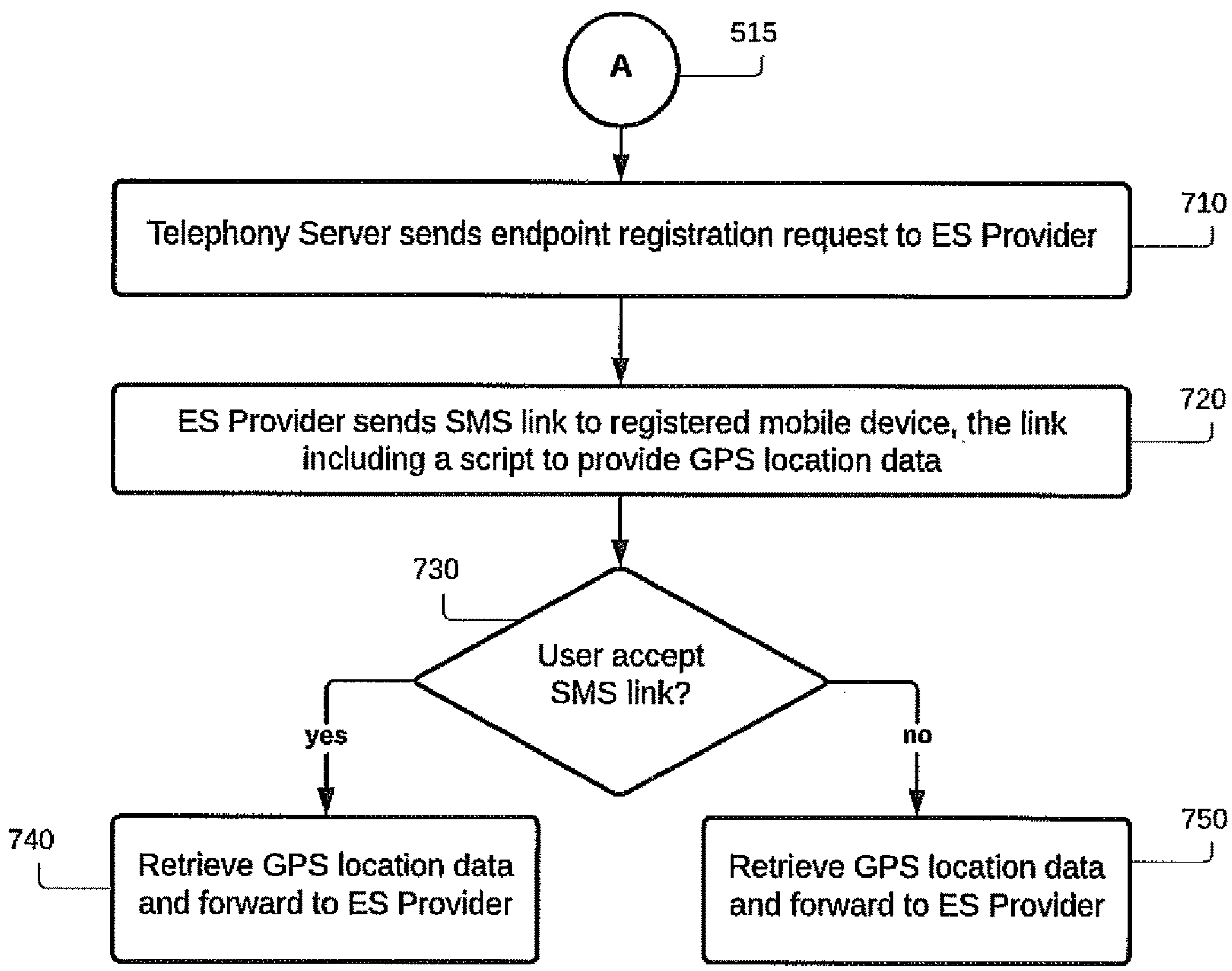


FIG. 8

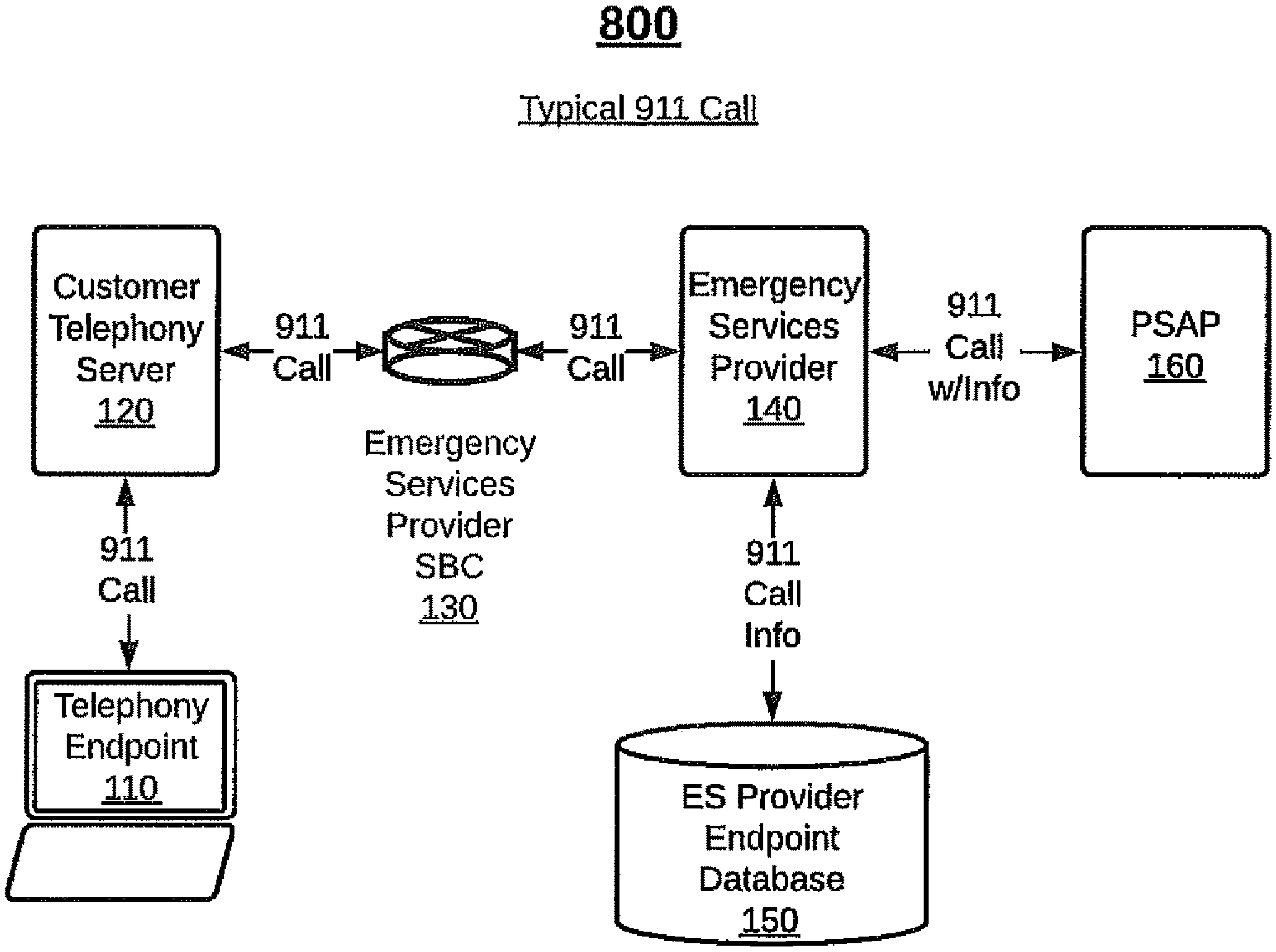
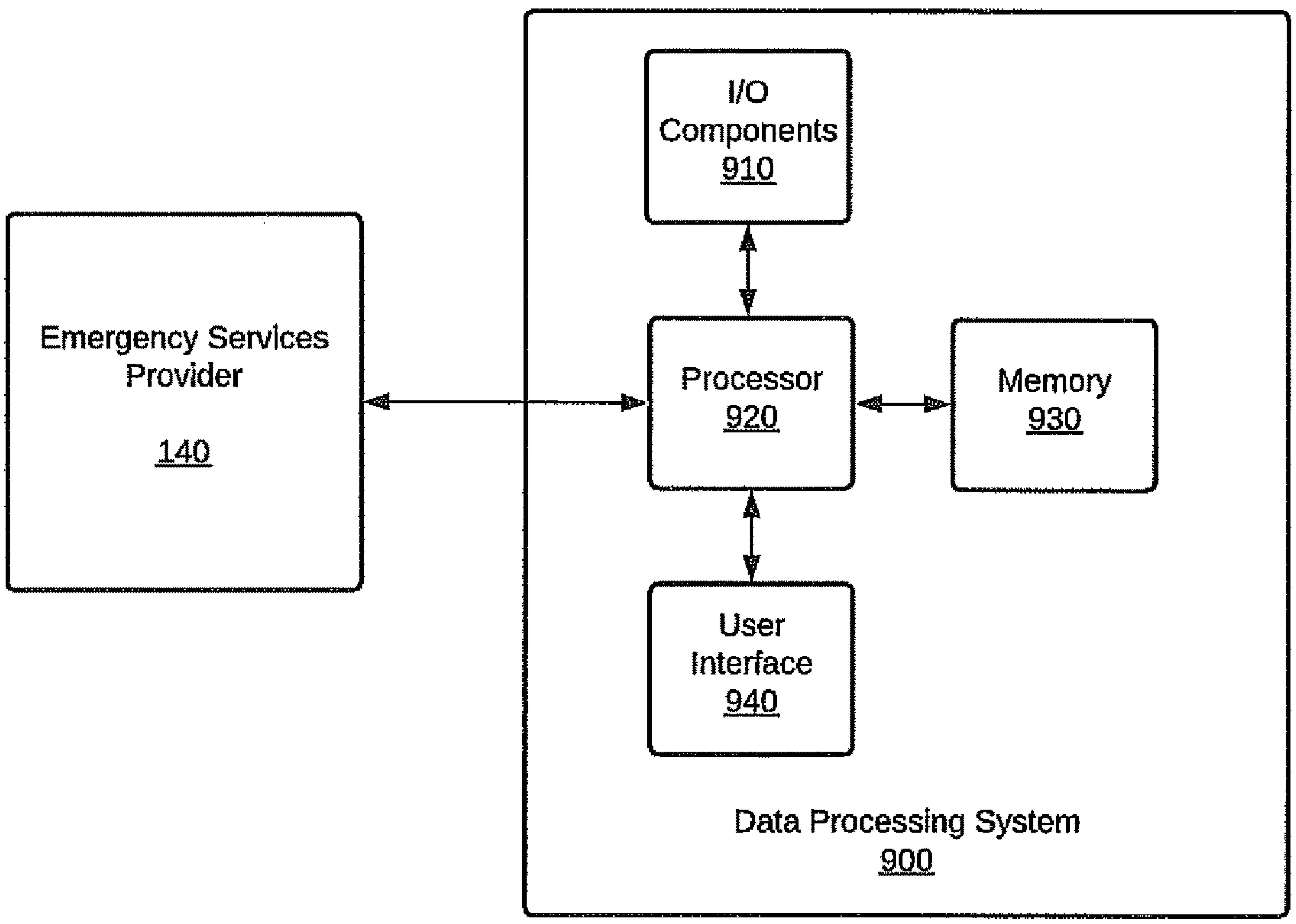

800
Typical 911 Call
Customer Telephony Server 120
911 Call
911 Call
Emergency Services Provider 140
911 Call w/Info
PSAP 160
Emergency Services Provider SBC 130
911 Call
911 Call Info
Telephony Endpoint 110
ES Provider Endpoint Database 150

FIG. 9


I/O Components 910
Emergency Services Provider
140
Processor 920
Memory 930
User Interface 940
Data Processing System 900

TECHNIQUES FOR REGISTERING AN INTERNET PROTOCOL (IP) ENDPOINT FOR EMERGENCY SERVICES CALLING

TECHNICAL FIELD

Examples described herein are generally related to techniques for registering the location of Internet Protocol (IP) endpoints so they can make emergency services (e.g., 911) calls.

BACKGROUND

Emergency calling or 911 as it is known in the United States is a mandated and regulated aspect of telecommunications. End users of interconnected VoIP telephone networks must be able to dial 911 and be connected with a public safety answering point (PSAP) that is the most convenient based on the location of the caller. Emergency service (ES) providers handle 911 calls in a different manner than normal outbound calls. For instance, location data must be determined and used so as to be able to direct the call to the proper PSAP and subsequently relayed to first responders if necessary.

Most VoIP telephone systems keep records of the locations of each endpoint such that when a 911 call is made, the caller's location may be determined and embedded into the signaling of the call thereby allowing the ES provider to route the call to the proper PSAP and present the PSAP with, among other data points, the location data of the caller. Traditional VoIP endpoints typically refer to telephones that have a dedicated telephone number associated with them. Even if the telephone is part of a private branch exchange (PBX) system, it still may be associated with a unique extension that is part of the telephone number. However, there is a class of non-traditional VoIP IP endpoints that may be characterized as softphones that may be integrated into an interconnected VoIP telephony system. A softphone is merely a software application running on a computer device that can make and receive telephone calls as part of a VoIP telephony system. The softphone application is considered a VoIP endpoint but is not necessarily associated with a unique telephone number. Rather, it may be reachable by a VoIP telephony server using an alternate identification means such as, for instance, a session initiation protocol (SIP) universal resource identifier (URI) it is currently associated with. SIP URI is the address scheme for SIP endpoints that identifies the destination or endpoint for SIP traffic.

While a softphone client may dial 911 for an emergency call, there may not be a registered address associated with the endpoint. When the ES server receives the call, it may not have the ability to associate the caller/endpoint with an address and cannot, therefore, determine the proper PSAP to route the call. Nor can it include the current address of the caller. In cases where the ES server cannot determine the proper PSAP, it will default to a national call center. The dispatcher answering the call can hopefully determine the caller's address through conversation and perhaps re-route the call to the proper PSAP. Often, the caller may not be able to quickly or easily provide their location in conversation with the national emergency call center leading to potential delays in providing any needed assistance.

What is needed are techniques to allow an ES provider to dynamically obtain and register an address for a non-traditional IP endpoint when a VoIP telecommunication session is initiated.

SUMMARY

In one embodiment, techniques are described for obtaining current location data for a non-traditional telephony endpoint for emergency calling purposes. An emergency services (ES) provider receives, from a telephony server responding to a telecommunication session establishment request from a telephony endpoint, a location registration request, the location registration request including telephony endpoint identification information. The ES provider may push a quick response (QR) code to the telephony endpoint, the QR code when scanned by a mobile device causes the mobile device to retrieve its current location data. The ES provider may then receive the current location data from the mobile device and store it and the telephony endpoint identification information for subsequent use should a 911 call be made from that telephony endpoint. The ES provider may then send the telephony server an authorization acknowledgement for the telecommunication session establishment request.

In another embodiment, techniques are described for obtaining current location data for a non-traditional telephony endpoint for emergency calling purposes. An emergency services (ES) provider receives, from a telephony server responding to a telecommunication session establishment request from a telephony endpoint, a location registration request, and a mobile telephone number, the location registration request including telephony endpoint identification information. The ES provider may send a short message service (SMS) message containing a registration link to the mobile device telephone number that, when executed, causes a mobile device to retrieve its current location data. The ES provider may then receive the current location data from the mobile device and store it and the telephony endpoint identification information for subsequent use should a 911 call be made from that telephony endpoint. The ES provider may then send the telephony server an authorization acknowledgement for the telecommunication session establishment request.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a first network architecture for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **2** illustrates a second network architecture for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **3** illustrates a first message flow for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **4** illustrates a second message flow for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **5** illustrates a first flowchart for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **6** illustrates a second flowchart for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **7** illustrates a third flowchart for registering a non-traditional VoIP endpoint for emergency services according to an embodiment.

FIG. **8** illustrates a typical network architecture for connecting a non-traditional VoIP endpoint with a public service answering point (PSAP).

FIG. **9** illustrates an example of a computer based data processing system.

DETAILED DESCRIPTION

Various embodiments may include a system, method, apparatus, and/or computer program product that describe and claim techniques to register a non-traditional VoIP endpoint for emergency services with an emergency services (ES) provider. In one embodiment, the non-traditional VoIP endpoint may be a softphone client that is part of, for example, a Universal Communications as a Service (UCaaS) system that provides VoIP telephony services through a telephony server to a customer. The customer must provide for emergency services, however, to ensure that any endpoint capable of VoIP telephony can make a 911 call.

The techniques described herein utilize a location enabled (e.g., GPS) smartphone that is physically present with the user of a VoIP softphone client. When a softphone client (i.e., endpoint) attempts to initiate a session, the telephony server initiates a process to register the location of the endpoint with an ES server. The process involves linking the user's smartphone location based services (e.g., GPS) capability with the VoIP session as described below. The process may result in the sending of the smartphone's location/GPS data to the ES server so that the endpoint may be given a current location that may be used for 911 purposes. The GPS data may be converted to address data and the address may then be verified and formatted into a format acceptable to and usable by a PSAP.

Reference is now made to the drawings, wherein like reference numerals are used to refer to like elements throughout. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding thereof. It may be evident, however, that the novel embodiments can be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form in order to facilitate a description thereof. The intention is to cover all modifications, equivalents, and alternatives consistent with the claimed subject matter.

FIG. **1** a first network architecture **100** for registering a non-traditional VoIP endpoint for emergency services using a quick response (QR) code scheme according to an embodiment. The first network architecture **100** illustrates a user mobile device **105** such as a smartphone equipped with a camera and a non-traditional VoIP telephony endpoint **110** such as a laptop executing VoIP capable software. The endpoint **110** is communicable with a telephony server **120** via an IP network **115** (e.g., the Internet). The telephony server **120** is further communicable with an emergency services (ES) telephony provider **140**. The ES provider **140** maintains an ES provider endpoint database **150** comprising unique identifiers for each endpoint **110** as well as current location data for such endpoints **110**. The aforementioned system elements are configured to work together to register the endpoint **110** within the ES provider endpoint database **150** so that if a 911 emergency call is initiated from the endpoint **110**, it can be processed successfully by the ES provider **140**.

In one embodiment, this goal may be achieved through use of a QR code that is created by a registration module **145** within ES provider **140** and sent to the telephony endpoint **110** in response to the telephony endpoint **110** requesting a session. A QR code is a two-dimensional version of a barcode able to convey a wide variety of information almost instantly with the scan of a mobile device. In this case, the QR code contains information that, when scanned by the user mobile device **105**, instructs the user mobile device **105** to retrieve its own location data and forward same back to the registration module **145** where it may then be populated into the ES provider endpoint database **150**. Once the location data has been stored in ES provider endpoint database **150**, the registration module **145** may authorize the telephony endpoint's session request permitting it to initiate a telephony session. The process is further described with respect to the flowchart in FIG. **3** below.

FIG. **2** a second network architecture **200** for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. The second network architecture **200** illustrates a user mobile device **105** such as a smartphone and a non-traditional VoIP telephony endpoint **110** such as a laptop executing VoIP capable software. The user mobile device **105** is ultimately communicable with ES telephony provider **140** via a radio basestation **108** coupled with IP network **115**. The endpoint **110** is communicable with a telephony server **120** via an IP network **115** (e.g., the Internet). The telephony server **120** is further communicable with an emergency services ES telephony provider **140**. The ES provider **140** maintains an ES provider endpoint database **150** comprising unique identifiers for each endpoint **110** as well as current location data for such endpoints **110**. The aforementioned system elements are configured to work together to register the endpoint **110** within the ES provider endpoint database **150** so that if a 911 emergency call is initiated from the endpoint **110**, it can be processed successfully by the ES provider **140**.

In another embodiment, this goal may be achieved through use of an SMS registration message that is created by a registration module **145** within ES provider **40** and sent to user mobile device **105** in response to the telephony endpoint **110** requesting a session. In this embodiment, the SMS registration message contains a link that, when executed by the user on user mobile device **105**, instructs the user mobile device **105** to retrieve its own location data and forward same back to the registration module **145** where it may then be populated into the ES provider endpoint database **150**. Once the location data has been stored in ES provider endpoint database **150**, the registration module **145** may authorize the telephony endpoint's session request permitting it to initiate a telephony session. The process is further described with respect to the FIG. **4** below.

FIG. **3** illustrates a first message flow for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. In this embodiment, the telephony endpoint **110** sends a session request message **305** to the telephony server **120**. The session request message **305** is a request to allow the telephony endpoint **110** to establish a session with the telephony server **120** such that the telephony endpoint can make or receive calls, join teleconferences, etc. Upon receipt of the session request message **305**, telephony server **120** creates a registration request message **310** that it sends to the ES provider **140**. The registration request message **310** instructs the ES provider **140** to initiate a process for registering the telephony endpoint **110** in the ES database **150**. The registration request message **310** also includes a telephony endpoint identifier so that the telephony endpoint **110** may be contacted by the ES provider **140**. The registration request message **310** may be required to ensure that if the telephony endpoint **110** were to make a 911 call, the 911 call can be properly handled which includes contemporary location information.

In response to receiving the registration request message **310**, ES provider **140** sends a QR code pop up **315** to telephony endpoint **110** that causes the QR code pop up **315** to be displayed on telephony endpoint **110**. The user may then use their user mobile device **105** (e.g., smartphone) to scan **320** the QR code pop up **315**. The information contained in the QR Code may include instructions for the user mobile device to access and retrieve its current GPS location data and transmit it to a destination that is managed, accessed, and controlled by ES Provider **140**. Thus, upon successful scanning **320** of the QR code by user mobile device **105**, a QR Code verification message **325** including location data is sent to ES Provider **140**. The location data of the user mobile device **105** is then stored **325** in the ES database **150**. Because the mobile device **105** and the telephony endpoint **110** are both in possession of the user, the location of the user mobile device **105** may also be attributed to the location of the telephony endpoint **110**.

The ES Provider **140** acknowledges **330** storing a telephony endpoint identifier (received with registration request **310**) and location data **325** for the telephony endpoint **110** back to telephony server **120** in an authorize session request message **335**. The telephony server **120**, in turn, may then establish a session to the telephony endpoint **110**.

FIG. **4** illustrates a second message flow for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. In this embodiment, the telephony endpoint **110** also sends a session request message **405** to the telephony server **120**. Upon receipt of the session request message **405**, telephony server **120** creates an SMS registration request message **410** that it sends to the ES provider **140**. The SMS registration request message **410** instructs the ES provider **140** to initiate a process for registering the telephony endpoint **110** in the ES database **150**. The SMS registration request message **410** also includes a user mobile device **105** telephone number so that the user mobile device **105** may be contacted via SMS by ES provider **140**. Upon receipt of the SMS registration request message **410**, ES Provider **140** creates and sends a SMS registration link message **415** to user mobile device **105**. The user of user mobile **105** may then click or open the link which may launch a process that returns a SMS registration link response message **420** including location data to ES Provider **140**. The location data of the user mobile device **105** is then stored **325** in the ES database **150**. Because the mobile device **105** and the telephony endpoint **110** are both in possession of the user, the location of the user mobile device **105** may also be attributed to the location of the telephony endpoint **110**.

The ES Provider **140** acknowledges **430** storing a telephony endpoint identifier (received with SMS registration request **410**) and location data **425** for the telephony endpoint **110** back to telephony server **120** in an registration complete message **435**. The telephony server **120**, in turn, may then establish a session to the telephony endpoint **110**.

FIG. **5** illustrates a first flowchart **500** for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. This data flow may be representative of some or all of the operations executed by one or more logic, features, or devices described herein, such as any devices or systems described above with references to other figures herein. The flowchart **500** may comprise one or more steps or processes involved in registering an IP endpoint in a communications network as described elsewhere herein. The embodiments, however, are not limited to the number, type, order or arrangement of steps shown in FIG. **5**.

The registration process for a non-traditional VoIP telephony endpoint **110** begins when the telephony endpoint **110** attempts to initiate a telecommunication session with a telephony server **120** at step **505**. The term initiate may refer to the act of launching a software application (e.g., a softphone client) that is capable of telecommunications via telephony server **120**. Upon launch of such an application, the first step may be to ensure the telephony endpoint **110** is properly registered with an ES provider **140** so that potential emergency service (e.g., 911) calls may be properly handled. Telephony server **120** may then notify ES provider that telephony endpoint **110** has launched their softphone client application at step **510** necessitating an address registration process for emergency calling. The notification may include IP address information allowing the ES Provider to push a communication to the telephony endpoint **110**. The notification may further include a telephone number corresponding to a mobile user device **105** known to be associated with the user of telephony endpoint **110**. ES Provider **140** may then send a request to provide location data for the telephony endpoint **110** at step **515**. In one embodiment, this request may involve the sending of a QR code back to telephony endpoint **110** as will be described in more detail with respect to FIG. **6**. In another embodiment, this request may involve sending an SMS registration message to the user mobile device **105** associated with the user of the telephony endpoint **110** as will be described in more detail with respect to FIG. **7**. The process labeled "A" **520** represents the implementations of the aforementioned embodiments described below in FIGS. **6** and **7**.

The ES Provider **140** receives location information from user mobile device **105** in step **525**. The location information may be in the form of GPS coordinates that may be translated by the ES Provider **140** into address data and the address data may then be verified and formatted into a format acceptable to and usable by a PSAP.

For instance, a registration module **145** within ES Provider **140** may be responsible for communicating with the telephony server **120**, telephony endpoint **110**, and user mobile device **105**. The registration module **145** may receive the user mobile device **105** location data based on a response to a QR Code scan (FIG. **6**) or activation of an SMS registration link (FIG. **7**). ES Provider **140** may then validate the location information, store it, and acknowledge its receipt back to telephony server **120** at step **535**. For example, registration module **145** may utilize the Master Street Address Guide (MSAG), a database that houses all streets and addresses within their associated postal range for emergency service purposes to verify and format the location information. The MSAG Address Directory for any address-range belongs to a state or municipal authority who are responsible for updating the MSAG Directory and making it available for use. An ES Provider **140** may utilize the MSAG database when it comes to providing 911 access services. The address data may be geo-coded to assign an X/Y coordinate for each record, providing confirmation upon successful validation. The geo-coded address in the MSAG compliant format for the jurisdiction in question in the ES Provider database **150**. Each telephony endpoint's current address is then immediately available to respond to PSAP queries. In an alternative embodiment, the ES Provider **140** may leave the GPS data in its coordinate form if the PSAPs that may receive such data can process it in its coordinate form. This data may then be stored in an ES database **150** along with a telephony endpoint **110** identifier that may be used to bridge a telecommunication session from a PSAP to the telephony endpoint **110**. The telephony endpoint **110** identifier may be an IP address, a device ID or combination of both sufficient to allow the ES Provider **140** to establish a VoIP telecommunication session directly with the telephony endpoint whether or not such telephony endpoint **110** is associated with a telephone number. Upon successful updating of the ES database **150** with the verified location/endpoint identifier information, ES Provider **140** sends an acknowledgement message to telephony server **120**. The acknowledgement message informs the telephony server **120** that the telephony endpoint **110** registration process has successfully completed. Telephony server **120** may then authorize the telephony session request and establish the permissions necessary for the telephony endpoint **110** to make and receive interconnected VoIP calls at step **535**. Thereafter, the telephony endpoint **110**, which may be a laptop device or a tablet computer, can engage in interconnected VoIP telecommunications with the required ability to make 911 calls that include current address data. Inter-connected VoIP refers to telecommunications that can include endpoints connected to VoIP connections as well as endpoints connected to other telecommunication networks like the public switched telephone network (PSTN).

Because the telephony endpoint **110** is nomadic meaning it can change locations rather easily, there exists the possibility the address data may change which should be updated in the ES Provider database **150**. In one embodiment, telephony server **120** may monitor its connection with the telephony endpoint **110** in decision step **540**. If a change in connectivity is detected such as a change in the IP address with which it is exchanging VoIP traffic data, the telephony server may initiate an "update location" process in step **545**. This may entail having the telephony server **120** prompt the telephony endpoint **110** if their location has changed in decision step **550**. If the user response indicates no change in address, telephony server **120** goes back to monitoring for subsequent connectivity changes. If the user response is indicative of a change in location, control goes back to step **515** where the ES Provider **140** is informed by telephony server **120** that a new registration process is needed.

FIG. **6** illustrates a second flowchart **600** for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. This data flow may be representative of some or all of the operations executed by one or more logic, features, or devices described herein, such as any devices or systems described above with references to other figures herein. The flowchart **600** may comprise one or more steps or processes involved in registering an IP endpoint in a communications network as described elsewhere herein. The embodiments, however, are not limited to the number, type, order or arrangement of steps shown in FIG. **6**.

In this embodiment, ES Provider **140** has just received (in step **510**) a registration request from a telephony server **120** on behalf of a telephony endpoint **110**. The ES Provider **140** may then generate and push a QR code to the telephony endpoint **110** in step **610**. The QR code may contain instructions to fetch and return GPS location data of the device that scans the QR code. In addition, the QR code may contain information it has already received about the telephony endpoint **110** in the initial registration request message. The QR code may be presented on the display of the telephony endpoint **110**. A user mobile device **105** may then be used to scan the QR code in step **620**. The process takes advantage of the co-location of the telephony endpoint **110** and the user mobile device **105** to infer that the location of the user mobile device **105** is the same as the location of the telephony endpoint **110**. Thus, when the user mobile device **105** scans the QR code in step **620**, the user mobile device is prompted to retrieve its current location data which may be in the form of GPS coordinate data. This location data along with the telephony endpoint identification information may be returned to the ES Provider **140** in step **630**. Processing and control for the remaining steps of the registration process are returned to and described in FIG. **5** above.

FIG. **7** illustrates a third flowchart **700** for registering a non-traditional VoIP endpoint for emergency services according to an embodiment. This data flow may be representative of some or all of the operations executed by one or more logic, features, or devices described herein, such as any devices or systems described above with references to other figures herein. The flowchart **700** may comprise one or more steps or processes involved in registering an IP endpoint in a communications network as described elsewhere herein. The embodiments, however, are not limited to the number, type, order or arrangement of steps shown in FIG. **7**.

In this embodiment, ES Provider **140** has just received a registration request from a telephony server **120** on behalf of a telephony endpoint **110** in step **710**. The ES Provider **140** may then generate and push an SMS registration link to the user mobile device **105** in step **720**. The SMS registration link, when executed, may contain instructions to fetch and return GPS location data of the user mobile device **105**. The ES Provider **140** may have already received the telephone number for the user mobile device **105** in the initial registration request message. The process takes advantage of the co-location of the telephony endpoint **110** and the user mobile device **105** to infer that the location of the user mobile device **105** is the same as the location of the telephony endpoint **110**. The user of the user mobile device **105** may then decide whether to execute the link received in the SMS message in decision step **730**. If the user executes the link received in the SMS message, the user mobile device **105** will retrieve its current location data which may be in the form of GPS coordinate data. This location data along with telephony endpoint identification information may be returned to the ES Provider **140** in step **740**. If the user opts not to execute the link received in the SMS message, the registration process is terminated. Processing and control for the remaining steps of the registration process are returned to and described in FIG. **5** above.

FIG. **8** illustrates a typical network architecture **800** for connecting a non-traditional VoIP endpoint **110** with a public service answering point (PSAP) **160**. Once the registration process described in FIGS. **3-7** has been completed, telephony endpoint **110** can make an emergency (e.g., 911) and it will be handled as would any other 911 call from a telephony endpoint. For instance, the telephony endpoint dials 911 and the telephony server **120** immediately recognizes it as an emergency call and routes it, along with a telephony endpoint identifier, to the ES Provider **140** via an ES Provider session border controller (SBC) **130**. The ES Provider **140** dips its ES Provider database **150** to obtain the location data associated with the telephony endpoint making the call. Once the location data is retrieved, the ES Provider **140** determines the proper PSAP **160** to which to route the call based on the location information. The ES Provider then routes the call and any other required data (e.g., location data and callback data) to that PSAP **160** and establishes a media connection between the telephony endpoint **110** and PSAP **160**.

FIG. **9** illustrates an example of a computer based data processing system **900** suitable for use with any of the examples described above. Although the example data processing system **900** is shown as in communication with an

ES provider **140** in accordance with embodiments of the present inventive concept, the data processing system **900** may also be part of the ES provider **140** without departing from the scope of the present inventive concept. In some examples, the data processing system **900** can be any suitable computing device for performing operations according to the embodiments discussed herein described herein.

As illustrated, the data processing system **900** includes a processor **920** communicatively coupled to I/O components **910**, a user interface **940** and a memory **930**. The processor **920** can include one or more commercially available processors, embedded processors, secure processors, microprocessors, dual microprocessors, multi-core processors, other multi-processor architectures, another suitable processing device, or any combination of these. The memory **930**, which can be any suitable tangible (and non-transitory) computer-readable medium such as random access memory (RAM), read-only memory (ROM), erasable and electronically programmable read-only memory (EEPROMs), or the like, embodies program components that configure operation of the data processing system **920**.

I/O components **910** may be used to facilitate wired or wireless connections to devices such as one or more displays, game controllers, keyboards, mice, joysticks, cameras, buttons, speakers, microphones and/or other hardware used to input or output data. Memory **930** represents nonvolatile storages such as magnetic, optical, or other storage media included in the data processing system and/or coupled to processor **920**.

The user interface **940** may include, for example, a keyboard, keypad, touchpad, voice activation circuit, display or the like and the processor **920** may execute program code or instructions stored in memory **930**.

It should be appreciated that data processing system **900** may also include additional processors, additional storage, and a computer-readable medium (not shown). The processor(s) **920** may execute additional computer-executable program instructions stored in memory **930**. Such processors may include a microprocessor, digital signal processor, application-specific integrated circuit, field programmable gate arrays, programmable interrupt controllers, programmable logic devices, programmable read-only memories, electronically programmable read-only memories, or other similar devices.

The aforementioned flow logic and/or methods show the functionality and operation of various services and applications described herein. If embodied in software, each block may represent a module, segment, or portion of code that includes program instructions to implement the specified logical function(s). The program instructions may be embodied in the form of source code that includes human-readable statements written in a programming language or machine code that includes numerical instructions recognizable by a suitable execution system such as a processor in a computer system or other system. The machine code may be converted from the source code, etc. Other suitable types of code include compiled code, interpreted code, executable code, static code, dynamic code, object-oriented code, visual code, and the like. The examples are not limited in this context.

If embodied in hardware, each block may represent a circuit or a number of interconnected circuits to implement the specified logical function(s). A circuit can include any of various commercially available processors, including without limitation an AMD® Athlon®, Duron® and Opteron® processors; ARM® application, embedded and secure processors; IBM® and Motorola® DragonBall® and PowerPC® processors; IBM and Sony® Cell processors; Qualcomm® Snapdragon®; Intel® Celeron®, Core (2) Duo®, Core i3, Core i5, Core i7, Itanium®, Pentium®, Xeon®, Atom® and XScale® processors; and similar processors. Other types of multi-core processors and other multi-processor architectures may also be employed as part of the circuitry. According to some examples, circuitry may also include an application specific integrated circuit (ASIC) or a field programmable gate array (FPGA), and modules may be implemented as hardware elements of the ASIC or the FPGA. Further, embodiments may be provided in the form of a chip, chipset or package.

Although the aforementioned flow logic and/or methods each show a specific order of execution, it is understood that the order of execution may differ from that which is depicted. Also, operations shown in succession in the flowcharts may be able to be executed concurrently or with partial concurrence. Further, in some embodiments, one or more of the operations may be skipped or omitted. In addition, any number of counters, state variables, warning semaphores, or messages might be added to the logical flows or methods described herein, for purposes of enhanced utility, accounting, performance measurement, or providing troubleshooting aids, etc. It is understood that all such variations are within the scope of the present disclosure. Moreover, not all operations illustrated in a flow logic or method may be required for a novel implementation.

Where any operation or component discussed herein is implemented in the form of software, any one of a number of programming languages may be employed such as, for example, C, C++, C#, Objective C, Java, Javascript, Perl, PHP, Visual Basic, Python, Ruby, Delphi, Flash, or other programming languages. Software components are stored in a memory and are executable by a processor. In this respect, the term "executable" means a program file that is in a form that can ultimately be run by a processor. Examples of executable programs may be, for example, a compiled program that can be translated into machine code in a format that can be loaded into a random access portion of a memory and run by a processor, source code that may be expressed in proper format such as object code that is capable of being loaded into a random access portion of a memory and executed by a processor, or source code that may be interpreted by another executable program to generate instructions in a random access portion of a memory to be executed by a processor, etc. An executable program may be stored in any portion or component of a memory. In the context of the present disclosure, a "computer-readable medium" can be any medium (e.g., memory) that can contain, store, or maintain the logic or application described herein for use by or in connection with the instruction execution system.

A memory is defined herein as an article of manufacture and including volatile and/or non-volatile memory, removable and/or non-removable memory, erasable and/or non-erasable memory, writeable and/or re-writeable memory, and so forth. Volatile components are those that do not retain data values upon loss of power. Nonvolatile components are those that retain data upon a loss of power. Thus, a memory may include, for example, random access memory (RAM), read-only memory (ROM), hard disk drives, solid-state drives, USB flash drives, memory cards accessed via a memory card reader, floppy disks accessed via an associated floppy disk drive, optical discs accessed via an optical disc drive, magnetic tapes accessed via an appropriate tape drive, and/or other memory components, or a combination of any two or more of these memory components. In addition, the

RAM may include, for example, static random access memory (SRAM), dynamic random access memory (DRAM), or magnetic random access memory (MRAM) and other such devices. The ROM may include, for example, a programmable read-only memory (PROM), an erasable programmable read-only memory (EPROM), an electrically erasable programmable read-only memory (EEPROM), or other like memory device.

The devices described herein may include multiple processors and multiple memories that operate in parallel processing circuits, respectively. In such a case, a local interface, such as a communication bus, may facilitate communication between any two of the multiple processors, between any processor and any of the memories, or between any two of the memories, etc. A local interface may include additional systems designed to coordinate this communication, including, for example, performing load balancing. A processor may be of electrical or of some other available construction.

It should be emphasized that the above-described embodiments of the present disclosure are merely possible examples of implementations set forth for a clear understanding of the principles of the disclosure. It is, of course, not possible to describe every conceivable combination of components and/or methodologies, but one of ordinary skill in the art may recognize that many further combinations and permutations are possible. That is, many variations and modifications may be made to the above-described embodiment(s) without departing substantially from the spirit and principles of the disclosure. All such modifications and variations are intended to be included herein within the scope of this disclosure and protected by the following claims.

In the foregoing Detailed Description, it can be seen that various features are grouped together in a single example for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed examples require more features than are expressly recited in each claim. Rather, as the following claims may reflect, inventive subject matter may lie in less than all features of a single disclosed example. Thus, the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separate example. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein," respectively. Moreover, the terms "first," "second," "third," and so forth, are used merely as labels, and are not intended to impose numerical requirements on their objects.

It is emphasized that the Abstract of the Disclosure is provided to comply with 37 C.F.R. Section 1.72(b), requiring an abstract that will allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims.

The invention claimed is:

1. A method executable by a server hosted by an emergency services provider server, the method comprising:

receiving a request, via a telephony server, for a non-emergency telecommunication session, the request originating from a telephony endpoint;

determining that location data for the telephony endpoint is not registered with the emergency services provider server;

sending one of a quick response (QR) code or a barcode to the telephony endpoint that when rendered by the telephony endpoint and optically scanned by a mobile device causes the mobile device to retrieve location data of the mobile device;

receiving the location data of the mobile device;

registering, for purposes of subsequent emergency calling, the location data of the mobile device as the location data for the telephony endpoint with the emergency services provider server; and

authorizing the telephony endpoint for the non-emergency telecommunication session only if the telephony endpoint has a location registered with the emergency services provider server.

2. The method of claim **1**, wherein the location data comprises global data positioning (GPS) coordinates, the method further comprising:

converting the GPS coordinates to an address;

verifying the address is valid; and

storing the verified address as the location data of the telephony endpoint.

3. The method of claim **1**, wherein the location data comprises global data positioning (GPS) coordinates, the method further comprising:

storing the GPS coordinates as the location data of the telephony endpoint.

4. The method of claim **1**, wherein optically scanning the QR code or bar code further causes the mobile device to communicate the location data to the emergency services provider server.

5. A computing system hosted by an emergency services provider server, comprising:

memory; and

one or more processors coupled to the memory and configured to:

receive a request, via a telephony server, for a non-emergency telecommunication session, the request originating from a telephony endpoint;

determine that location data for the telephony endpoint is not registered with the emergency services provider server;

send one of a quick response (QR) code or a barcode to the telephony endpoint that when rendered by the telephony endpoint and optically scanned by a mobile device causes the mobile device to retrieve location data of the mobile device;

receive the location data of the mobile device;

register, for purposes of subsequent emergency calling, the location data of the mobile device as the location data for the telephony endpoint with the emergency services provider server; and

authorize the telephony endpoint for the non-emergency telecommunication session only if the telephony endpoint has a location registered with the emergency services provider server.

6. The computing system of claim **5**, wherein the location data comprises global data positioning (GPS) coordinates, the one or more processors further configured to:

convert the GPS coordinates to an address;

verify the address is valid; and

store the verified address as the location data of the telephony endpoint.

7. The computing system of claim **5**, wherein the location data comprises global data positioning (GPS) coordinates, the one or more processors further configured to:

store the GPS coordinates as the location data of the telephony endpoint.

8. The computing system of claim **5**, wherein optically scanning the QR code or bar code further causes the mobile device to communicate the location data to the emergency services provider server.

9. A non-transitory computer readable media comprising computer-executable instructions that, when executed by a computing system hosted by an emergency services provider server, cause the computing system to:

receive a request, via a telephony server, for a non-emergency telecommunication session, the request originating from a telephony endpoint;

determine that location data for the telephony endpoint is not registered with the emergency services provider server;

send one of a quick response (QR) code or a barcode to the telephony endpoint that when rendered by the telephony endpoint and optically scanned by a mobile device causes the mobile device to retrieve location data of the mobile device;

receive the location data of the mobile device;

register, for purposes of subsequent emergency calling, the location data of the mobile device as the location data for the telephony endpoint with the emergency services provider server; and

authorize the telephony endpoint for the non-emergency telecommunication session only if the telephony endpoint has a location registered with the emergency services provider server.

10. The non-transitory computer readable media of claim **9**, wherein the location data comprises global data positioning (GPS) coordinates.

11. The non-transitory computer readable media of claim **10**, comprising computer-executable instructions that, when executed by a computing system hosted by an emergency services provider server, cause the computing system to:

convert the GPS coordinates to an address;

verify the address is valid; and

store the verified address as the location data of the telephony endpoint.

12. The non-transitory computer readable media of claim **10**, comprising computer-executable instructions that, when executed by a computing system hosted by an emergency services provider server, cause the computing system to:

store the GPS coordinates as the location data of the telephony endpoint.

13. The non-transitory computer readable media of claim **9**, wherein optically scanning the QR code or bar code further causes the mobile device to communicate the location data to the emergency services provider server.

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